On June 15th 2010, a Single Engine Air Tanker (SEAT), call sign T-xxx, was returning from the Duckett Fire after dropping fire retardant for Division Bravo. The pilot stated that approximately 12 miles out from the Fremont County Airport (1V6) he monitored the airport's Automated Weather Observation System (AWOS) to receive the current weather information.

The pilot approached the airport from the Northwest to enter a downwind to Runway 11 (R11). On the final approach to R11 the pilot noticed a large "dust devil" (Thermal) crossing the runway and the pilot decided to abort the landing and continue flying the runway heading.

The pilot decides, based on the visual confirmation of the airport wind indicators (4), and prior knowledge of the runway, to land on Runway 17 (R17). The pilot enters left downwind, base and final for 17. The pilot elects to fly a high observation pass of R17 to check wind conditions. The pilot was satisified with the quartering prevailing wind from the West, South-West (AWOS) and elected to land R17.

The pilot entered a closed left traffic pattern for R17 and at the approach end of R17, just after the runway threshold, the pilot encountered a "wind shear" and dropped approximately 80 to 100 feet. The pilot arrested the sink rate by applying engine power, landing approximately 200' from the approach end of the runway.

The pilot continued on R17 and just after crossing taxiway A1, encountered a left wind shear, applied rudder, brake and power to get more air over the wing for additional directional control. The pilot then applied full take off power. The aircraft continued right of runway center and went off runway. The right tire contacted a small berm forcing the aircraft to bank left. The aircraft continued on it's heading, gaining airspeed to become airborne when the left leading edge of the wing contacted a runway marker, breaking off the marker and damaging the leading edge, lower wing skin and left aileron. The left wing tip contacted the ground but was undamaged except for scratches.

The pilot was able to get the aircraft airborne and banked left for a landing on runway 29 (R29). The pilot landed uneventfully on R29 and taxied back to the Airtanker base and was at the chocks at 1324 hours.

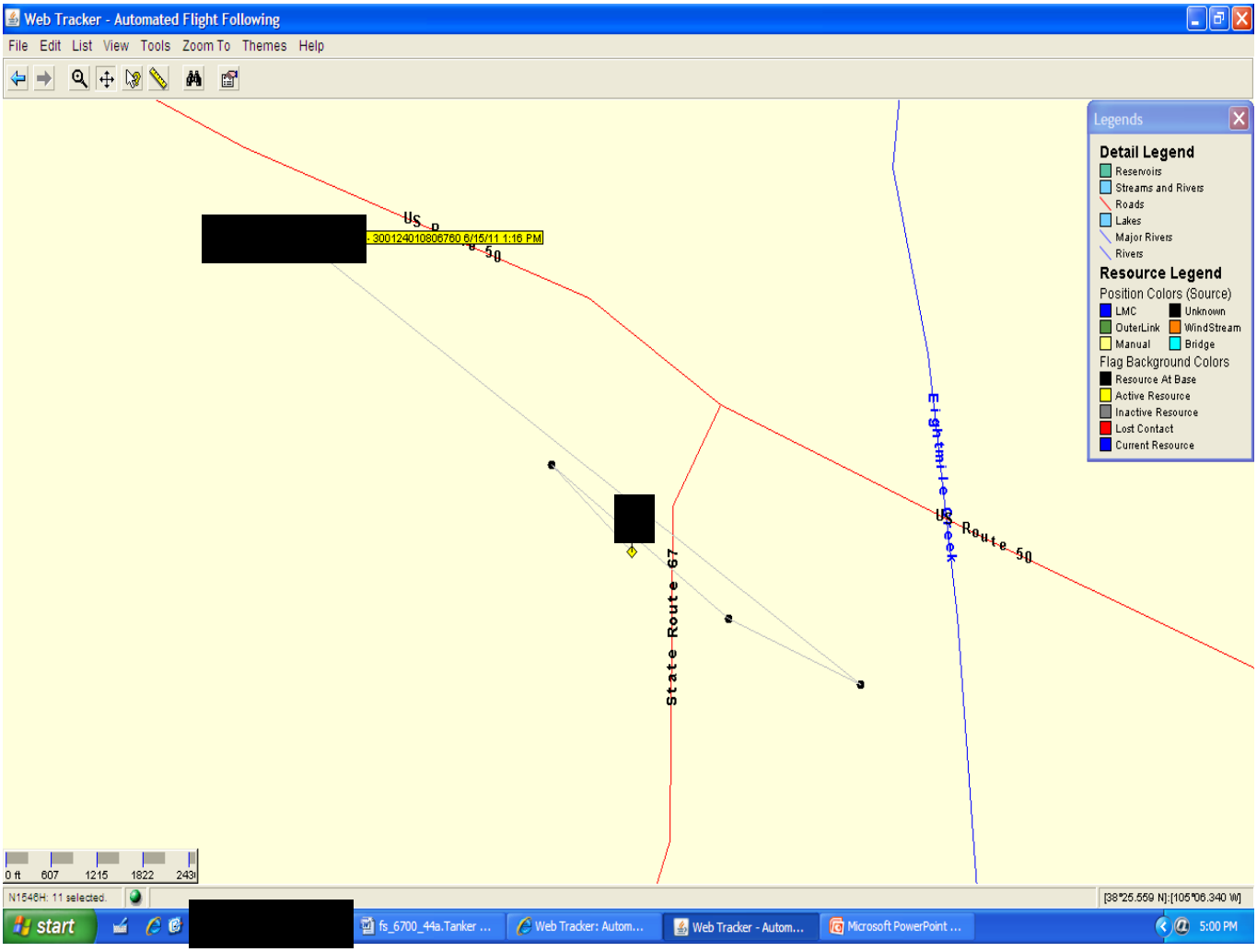
The pilot was uninjured by the incident.

Corrective Action

RASM 6/27/2011 - the NTSB has reviewed the damage to the aircraft and has classified this as an incident. The USFS was determined to have operational control of the aircraft at the time of the incident and coordinated an Interagency effort to investigate the incident. That investigation is still underway, but for learning purposes, points of the incident are being documented in this SAFECOM.

Weather observations recorded at the airport (SAI AWOS/ASOS) during the 10 minute period (1:16 – 1:26 pm) in which the aircraft attempted to land showed average wind speeds 14-21 mph and gusts of 40 mph. Winds were variable as recorded at time intervals 1:16 pm = 150 v 210, 1:17-1:18 pm = 190 v 280 and 1:25 pm = 210 v 270 degrees. Visibility was 10 miles and clear.

(SAI AWOS/ASOS) recordings prior to 1:16 pm and after 1:27 pm show consistent and steady winds 6-18 mph and with gusts 15-23 mph.



This hazard is currently not documented in the "Aviation Risk Management Handbook"

System - SEAT, Sub system – environment, Hazard – wind shear on landing, causing the pilot to lose control of the aircraft resulting in an incident or accident. Mitigation – abort landing and hold at a safe altitude and location while monitoring for conditions to improve. Divert to an airport with more favorable conditions.

A review of past SAFECOM submissions 2006 to present identified the following:

10-0669
SEAT departed to the west from Twin Falls Airport at 1918 to the Mile Marker 11 fire. During takeoff roll, a clear air micro burst/wind shear was encountered out of the southwest at 58 MPH. There was low visibility due to blowing dirt which obscured the runway. The wind quickly diminished to 12 MPH. The SEAT continued with normal flight and climb conditions after crossing the departure end of the runway. The aircraft then flew to the west approximately 1 mile, then made left hand bank to the southwest. The pilot experienced good lift, then a sudden downdraft, resulting sudden drop in aircraft altitude {estimated at plus 60 feet AGL}. The pilot jettisoned half of the load {400 gallons at coverage level 4} to maintain flight conditions. Pilot reported he had encountered a strong down draft but had regained altitude and flight was normal after the jettison. GPS location was provided by pilot of the jettison site, and stated he was able to resume mission with half load when another down draft was encountered near the airport with

another severe loss in altitude. Pilot was instructed by Air Base Manager to jettison remaining retardant, abort mission, and return to air base.

10-0507
Txxx departed GCD with instructions from the Ramp Manager to hold at his discretion with active lighting cell west of airport. The PIC studied his radar and decided to depart with an immediate turn to the north. Airbase operations were then shut down through the dispatch center until the storm passed. Twenty minutes later on way back from incident #089. Dispatch informed Txxx of storm near airport, pilot circled several times and observed VFR conditions and proceeded to land without incident. The SEMG visited with visiting a/c SEMG and received follow-up phone call from pilot.

08-0457
Aircraft was touching down, crosswind gust from the right, lifted the right wing, the left wing tip touched the runway.

08-0454
On landing to hold at San manual Airport (E77) which was a 20 mph cross wind Txxx went off the left side of the runway with one wheel on the dirt apron while the other wheel remained on the surfaced runway before coming to a stop. Pilot inspected the aircraft for damage, and none was found.

07-0933
We were dispatched to the Irish Spring Fire at 1605. I made contact with the air attack and he told me to hold to the west of the fire while he looked for a spot to dump our load on. After finding a spot on the east side, the air attack wanted me to drop near two smoke columns off the top of a ridge line. The wind was blowing about 20 - 30 miles per hour. After doing a dry run I told air attack that I was going to do a drop into the wind. He agreed and I called downwind and did the required checks. I kept my speed up and turned final and stayed high due to the terrain and surface winds. When I was about a half mile final, I experienced severe turbulence and a loss of 2000 feet per second. I immediately punched my load off and applied max power and flew clear of the bad terrain. I advised air attack that there was very bad turbulence and he told me to go back to Ontario and hold. Air attack advised dispatch that no more SEATS were needed due to turbulence.

In addition to the body of the SAFECOM, please take time to review the following.

6 Minutes for Safety Topic: Mountain Flying

References:

1) FAA-P-8740-60 / AFS-803 (1999), "*Tips on Mountain Flying."*
2) Air Traffic Manager, Denver Air Route Traffic Control Center, *"Mountain Flying, Techniques and Tips"*
3) Department of Transportation Book AC91-15, *"Terrain Flying."*

NOTE: This outline is not all inclusive, nor is it directive in nature. Many of the subjects discussed in this outline can be found in non-mountainous areas or at low altitudes. For example, density altitudes over 8500' MSL can be found regularly on the eastern plains of Colorado in the summer. Also, dangerous mechanical and or mountain wave turbulence can be found in areas that aren't usually considered mountainous. Places like the Rocky Mountains / Sierra Front are where all of these concepts can be experienced. In addition, keep in mind that fires in any

geographic area can and do produce their own localized weather and the hazards described in this outline can occur in these situations as well.

Pilot Ability. Carefully consider your experience and background before beginning a fire mission into mountainous terrain. Mountain flying in many areas will stretch your abilities to fly the airplane proficiently, navigate, and deal with weather. Consider your ability to react to strong winds and the up and down drafts they may cause. The aircraft gross weight and its affect on performance should be carefully considered.

Visibility. Many experienced mountain pilots recommend having at least 15 miles of visibility before attempting mountain flights. In the fire environment, make sure you have enough visibility to safely maneuver the aircraft to avoid any obstacles. Remember, turn radius is greater due to increased TAS, engine response time is increased and thrust is reduced due to higher density altitudes….give yourself a margin.

Winds. Strong winds can cause some of the most dangerous conditions you'll have to contend with in the mountains. Mountain top winds in excess of 25 knots are indicative of moderate to severe turbulence at ridge top levels as well as the likelihood of very strong up and down drafts. Plan your approach / drop and leave an "out" in case you have to go through dry or encounter unexpected turbulence / down drafts. When encountering a downdraft, maintain sufficient airspeed. Jettison part / all of the load if necessary. Guard against stalling the aircraft and fly out of the downdraft immediately with full power. Proceed to an area of updraft or smoother air. Pay close attention to the forecasts at and above the mountain ridges. In the west, that usually means the 9000' and 12,000' wind forecasts. In the east, you'll look at lower wind level forecasts. Winds above 25 knots at these levels should be a warning sign regarding turbulence and updraft / downdraft potential.

Mountain Wave. When the wind speed is above about 25 knots and flowing perpendicular to the ridge lines, the air flow can form waves, much like water flowing over rocks in a stream bed. The waves form downwind from the ridge line and will be composed of very strong up and down drafts, with the probability of dangerous rotor action under the crests of the waves. If enough moisture is present, (standing) lenticular clouds can form to give a visual indication of the wave action. Standing lenticular clouds are also an indication of moderate to severe turbulence.

Winds Through Passes. Winds flowing through the narrow restriction of a mountain pass tend to increase in velocity. When the winds are forecast above 20 knots, be aware that this phenomenon may cause turbulence and drafts.

Orographic Lifting. As the wind blows moist air upslope, it will cool and may form clouds. If, as is often the case in winter, the air is stable, the clouds will stay close to the mountain, forming a "cap" cloud. However, if the air is unstable, as is usually the case in summer, this initial lifting will be enough to start convection and result in thunderstorm formation.

Microbursts. Wet microbursts are typically found in the middle of an active thunderstorm or intense rain shower and avoiding the strong downdraft is relatively easy. Dry microbursts, however, are more insidious because they occur with little or no warning in the clear air beneath virga. Dry microbursts are common in and near the Rockies and other mountainous areas of the western U.S. in the summer. Dry microbursts are likely when thunderstorms with bases above about 3000' to 5000' AGL exist and the temperature/dew point spread on the surface is more than about 40 degrees (F). A good indicator of a dry microburst is when you see dust blowing underneath the thunderstorm. Recommend staying clear until the event passes (usually a few minutes).

Density Altitude. Density altitude is pressure altitude corrected for temperature. Higher density altitude reduces overall performance of the airplane. At higher density altitudes, takeoff and landing distances are increased, thrust is decreased, rate of climb and actual service ceiling are decreased, true airspeed is higher for a given indicated airspeed, and turning radius is larger for a given indicated airspeed (due to higher TAS). To help regain performance at high density altitudes, consider reducing aircraft weight (retardant and / or fuel load). Check your AFM performance data charts for takeoff and landing distances, climb rates, etc. Since your true airspeed is higher for a given indicated airspeed, many pilots respond to the visual cues of higher ground speed on takeoff by rotating at a lower IAS than normal. Rotating at too slow an airspeed may cause the airplane to take an even longer ground run than necessary. Turning radius is proportional to the square of true airspeed. For example, if you increase your TAS by only 10%, your turn radius will increase by 20%. In the fire pattern this may result in an overshooting turn

to final with the resultant last minute corrections, rushed approach, etc. If in doubt, go around. Higher density altitudes also affect best rate and angle of climb airspeeds. Refer to your AFM to be sure you are flying the correct airspeeds to get the performance you expect. Be extra cautious about getting slow at high density altitudes. Throttle response will be delayed (due to less dense air) and thrust is reduced due to less air over the prop blades. Stalls at high density altitudes and close to the ground can be devastating with insufficient time / performance response to recover.

Ridge and Pass Crossing. A good technique is to cross ridges or passes at the ridge elevation plus at least 1000' AGL. If the winds at mountain top level are above 20 knots, increase to 2000' AGL. Plan to be at that altitude at least three miles before reaching the ridge and stay at that altitude until at least three miles past it. This clearance zone will give you a reasonable safety zone to avoid the most severe turbulence and down drafts in windy conditions and / or the ability to turn the aircraft around in a descending turn if necessary. If conditions or airplane performance dictate, you may need to fly along the windward side of a ridge to find updrafts for gaining altitude before crossing a ridge. You may also need to circle before reaching the ridge if climbing out of a valley airport. Cross ridges at a 45° angle. This allows you to turn away from the ridge quicker if you encounter a severe downdraft or turbulence. Once you have crossed the ridge, turn away from it at a 90° angle to get away from the most likely area of turbulence quickly. Plan your crossing to give yourself the ability to turn and descend toward lower terrain quickly if necessary.

Rough Terrain. Heads up near or above abrupt changes of terrain such as cliffs or rugged areas. Dangerous turbulence can be expected, especially with high winds.

Box Canyons. Try to avoid flying up the middle of a canyon. It's better to fly along one side or the other (preferably the downwind side) at sufficient altitude to be in a better position to execute a 180-degree turn. Allowing sufficient altitude for a descending 180-degree turn along with a turn into the wind (if possible) decreases actual turn radius across the ground. Use extra caution when mountain tops are obscured. Many accidents occur as a result of pilot's turning up the wrong drainage, ending sadly in a box canyon. Monitor GPS closely.